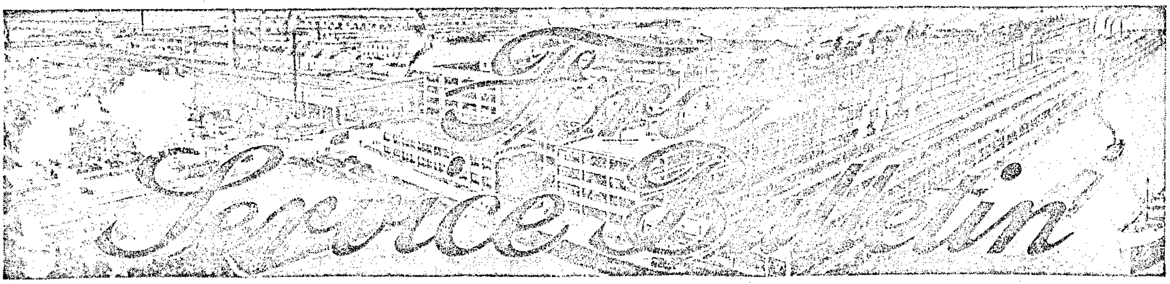

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Winnipeg Tribune, Saturday, March 29.

McRae & Griffith are to be complimented on the above service advertising. Advertise your flat rate system. It is your biggest service salesman.

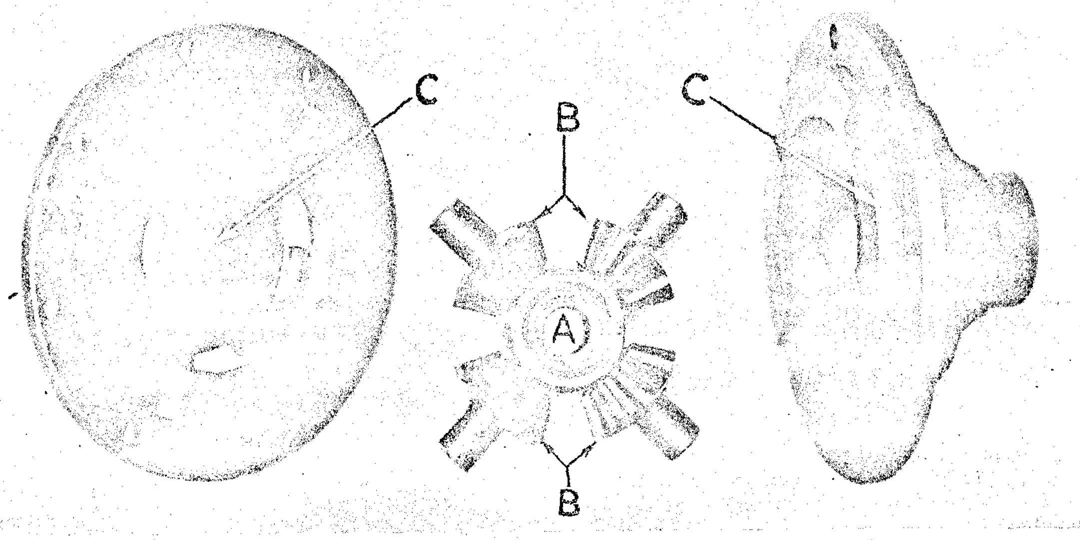

Fig. 3

New Design Truck Differential Pinion Shaft No. 1033B.

The new design truck differential pinion shaft A No. 1033B (Figure 3) has four shafts instead of two as in the old type No. 1033. Four differential pinions B No. 1032 are used with the new shaft. The old design shaft will still be supplied for repairs.

New Design Differential Gearcase Right or Left, No. 1028.

The change in the differential pinion shaft necessitated a change in the gear cases C No. 1028. New gear cases are made to accomodate the four shafts. The old design case will be automatically discontinued as the new design case may be used with either the old or the new pinion shaft.

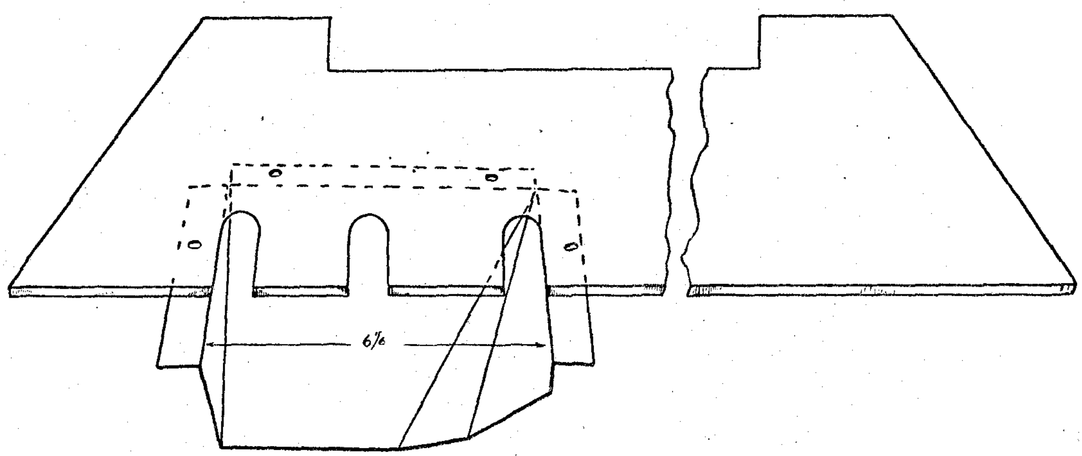

Fig. 4

New Pedal Shield

The pedal shield No. 3680 (Figure 4) has been designed to fasten on the lower side of No. 1 floor board and keep the draft from coming through the pedal openings. The shield is fastened by four rivets No. T1408 which pass through the floor board plate and pedal shield. When installing the new shield it is necessary that the measurements of $6\frac{1}{16}''$ be held as shown on the sketch.

Babbitt Metal

The performance of the main bearings in the motor which you re-build should demand as much or more attention than any other unit. Are you as careful of the grade of babbitt you use, as you are of the workmanship put in the job? The babbitt used by this Company in the main bearings and connecting rods, is of a superior quality and made to our own specifications. You should be sure that the babbitt you use in repair work is of the superior quality originally installed at the factory. Buy your babbitt from the Ford Branch, where it is stocked at all times and safeguard yourself against inferior quality. When heating babbitt for pouring always use a torch, which will deliver as much heat as possible in order to prevent the oxidization of the tin. This oxidization of the tin occurs because the tin melts first at about 450°F, whereas the mixture of tin, copper and antimony melts at approximately 650°F and should be between 850° and 950° to pour properly. At this heat the babbitt will just begin to show a dull red around the edges of the pot. The dross which forms on the top of the hot babbitt is tin oxide and should be skimmed off just before the metal is transferred to the bearing. When filling the pot in preparation for heating do not place any more babbitt in it than you actually need or about 1½ pounds per set of bearings. The reason for this being that each time the babbitt is heated a certain amount of tin is lost through oxide and if you use a large quantity each time, it will not only take longer to heat, but will become harder and harder each time it is heated, due to the loss of the tin which is the softest metal making up the mixture.

In this you will keep the quality of the babbitt as near uniform as possible. Before pouring, always stir the babbitt thoroughly, as the copper and antimony being the more dense metals will sink to the bottom of the pot. Always use a new babbitt as old babbitt is full of impurities and will not give first class bearing. These impurities are always very detrimental to the align reamer and often score a crankshaft when it actually comes in contact with them.

Lincoln Cylinder Blocks and Heads

All Lincoln engines after motor No. 7820 have a new design of cylinder block and cylinder head.

This change does not affect the efficiency or performance of the engine but does give greatly improved appearance.

The compression ratio of the engine with the new cylinder head is exactly the same as that with the old head but there is slightly more water space around the compression chamber.

On account of the bead which is carried around the upper edge of the cylinder block and lower surface of the cylinder head, the gasket used with the new design parts is larger than the one used with the old type. Therefore, care should be taken that the correct gasket is furnished for service. Use Cylnider Head Gasket L-8357AR for engines with the first design blocks and heads and L-8357B for engines with the latest design.

The intake manifold used with engines after No. 7820 also has been slightly changed as to the shape of the flange which is bolted to the cylinder head. Here also a different gasket is required. Use L-2338AR for the first design and L-2338B for the latest design.

It should also be noted that on engines having the new cylinder block and head, nickel plated acorn type nuts are used on the cylinder head and intake manifold studs. The thread size remains the same.

Rear Fender to Body Bolt T. 8147.

Part No. S-949 tractor fender rear support to axle bracket extension bolt.

This part is obsolete being replaced by Model T 8147 rear fender to body bolt used on Tudor and Fordor.

Ford Mechanics' Section

(Continued from page 7, June, 1924, Service Bulletin)

Lubrication

Durability Test

Irrespective of the type of lubricating system employed in Tractor engines, oil is splashed at every stroke against the underside of the highly heated piston heads. This oil spray cools the piston to some extent but the heat absorbed by it causes a decomposition to take place in the oil. In this manner the oil within the sump is turned black, and solid black sediment is precipitated. The best lubricants show the greatest resistance to such decomposition and consequently deposit the least amount of sediment.

The laboratory method usually employed to determine sedimentation values is first to make the evaporation test as described previously. The greatly thickened oil is then treated with petroleum ether to separate the resinous matter in the form of a reddish brown precipitate. This is thoroughly washed with petroleum ether, dried, weighed and recorded as the percentage of Sediment. The evaporation and sedimentation values thus found are comparable to the service results obtained with the same oil in an engine.

Field Test for Sediment

This is one of the most important tests in determining the oil best adapted for the motor. If the dealer is making the test it is advisable to employ the tractors of several customers, as no two persons care for or drive their tractors in the same way or under identical circumstances. And, too, the condition of wear in two motors is seldom the same.

The crankcase should be drained and washed out with kerosene, the carbon removed, and valves ground before beginning the test. The hours of operation is then recorded, and the first sample tested under ordinary working conditions. The test should cover a period of from ten to twelve hours. The same kind of oil should be supplied to the motor as needed. At the end of the first test the hours are recorded and the crankcase drained. This oil should be stirred and a portion of it put into a clear glass bottle and allowed to stand undisturbed for 24 hours. At the end of this time it will be noted that a black sediment has precipitated to the bottom of the bottle. This sediment is composed of sediment already spoken of and minute particles of the metal parts of the engine worn off during the test. The best oils contain the least amount of sediment. The carbon is again removed, the valves ground, and the other samples tested as in the first case. The percentage of sediment is calculated for each sample drained from the engine at the conclusion of the test.

When the results of all the tests described have been obtained it may be that several oils are of about the same high grade, and apparently equally suited for our purpose. When this is the case we turn to the consideration of price, and in so doing must take into account the running hours observed in the field test. In this way it may be that a high-priced oil sometimes costs less for a given acreage than a low-priced oil. Price, however, should be the last thought as improper lubrication can do more harm than can be overcome by any amount of oiling, after the damage is done.

Oils

Tractor Lubricating

It has been found that oils which test in accordance with the following specifications can be used with very satisfactory results in both the Fordson Motor and Transmission.

Flash point	400 deg. F Minimum
Fire point	450 deg. F Minimum
Viscosity at	100 deg. F 600 Maximum
Viscosity at	210 deg. F 66 Minimum
Cold	45 deg. F Maximum

Truck

Rear Axle

The proper lubrication is one which will follow the cushion of the gears and work into and thoroughly lubricate the bearings. A heavy, straight petroleum oil, such as a refined cylinder stock, free from acids, alkali, moisture or thickness with the following physical properties should be used.

Gravity	°Be	22 (min)
Flash	°F	270 (min)
Fire	°F	600 (min)

Viscosity Saybolt University
100°F—210°F 145—160

Model "T" Motor

Flash	370 F Min.	
Fire	420 F Min.	
Viscosity at	100	290 Max.
Viscosity at	210	50 Min.
Cold	30 F Max.	

Ford Mechanics' Section

Cooling System

The development of power within the cylinders of an internal combustion engine is accomplished through the expansion of gases by heat. If it were possible to use all the expansive power developed by this heat, the operation of the internal combustion engine would be 100%. This heat is produced by first compression of the gases, then by burning them at a very high temperature. This great heat would soon burn all the oil from the cylinder walls, causing the valves to warp, the bearings to burn out and the pistons to seize hard and fast on the cylinder walls in the space of a few minutes, if some method were not employed to keep the cylinders cool. This should impress upon the mechanic the importance of a good cooling system, and the necessity of keeping this cooling system in perfect order at all times.

In order to keep the motor cool, we have provided it with water jackets around the cylinders and valves and in the cylinder head. The water is caused to flow by either power or gravity around the cylinder walls and through the head into the radiator, in which it is cooled and again returns to the water jackets. Air is forced through the fins and tubes of the radiator by a fan run off the motor. There are two methods of circulating the cooling water through the motor, i. e. Force and Thermo-syphon.

Force System

In the Force System the water is circulated through the water jackets by means of a pump. This pump forces the water from the bottom of the radiator through pipes to the connection at the bottom of the water jacket. This force carries the water through the jackets to the top of the cylinder head, from whence it flows to the top of the radiator where it is again cooled and circulated. This system has been used to good advantage on the Lincoln and some other large cars. In order to make the Force System work satisfactorily, some means of either controlling the circulation of air through the radiator or controlling the amount of water forced through the system, must be provided. The reason for this being that when a cooled motor is started the complete cooling system is set in motion and as the motor will not work satisfactorily until it is warmed up, it is necessary to get the water around the water jackets warmed up to a point just below boiling as soon as possible. In the Lincoln we have a Thermostatic shutter control. This shutter is placed in front of the radiator and remains closed preventing the fan from cooling the radiator until the temperature of the water has reached approximately 165°F, when the Thermostat automatically opens them. When the temperature of the water drops to approximately 145° the shutters should be practically closed.

The Condenser Tank

In conjunction with the cooling system of the Lincoln, a condenser tank is used. This tank is located in the left frame beneath the front floor boards. The condenser tank is air-tight to the atmosphere and is connected to the radiator overflow pipe which runs to the bottom of the tank. As the radiator is also air-tight to the atmosphere any vaporization in the radiator will condense in the overflow pipe and run down into the tank. When the liquid in the radiator cools a reverse action takes places. The vapor in the upper tank condenses causing the vacuum which draws the liquid back from the tank into the radiating connection. The Lincoln water pump is a centrifugal type of pump and is located ahead of the generator on the right hand side of the motor.

Thermo-Syphon System

Thermo-syphon system is a very efficient system. It is much simpler and requires none of the motor's power and is not affected by the change in speed of the motor. The principal operations of the Thermo-syphon System is based upon the fact that hot water is of a lower density than cold water and will therefore seek a higher level than cold water. As the water in the jacket is heated by contact with the combustion chamber walls it rises to the top of the jacket and into the head and from there it flows to the radiator through the connection at the bottom of the radiator syphon tank. From here it flows over the top of the radiator tubes and enters them to displace the cooled water which is descending. Hot water is lighter than cooled water and rises to the top just as oil will rise to the surface when poured into a vessel. As before stated the motor works more efficiently when it becomes thoroughly warmed up. This temperature will bring the water in the cooling system to just below the boiling point. In the Force System as before stated, some means of controlling the circulation must be provided in order to maintain a uniform temperature. In the Thermo-syphon System however, this operates automatically, as the water around the cylinder walls does not commence to flow until it has reached a temperature of approximately 180°F. It is obvious, therefore, that a motor using Thermo-syphon System will warm up to its most efficient working temperature much quicker than a motor using the pump which will keep the whole system in circulation. The Thermo-syphon System will maintain a fairly uniform temperature in hot and cold weather alike, as the speed at which the water flows is governed by this temperature.

It will be noticed that at the top of radiators of a Thermo-syphon System, there is a tank of considerable size. This is known as the syphon tank. It is located at the top of the tubes or cells of the radiator, and is for the twofold purpose of holding water to absorb any steam formed in the jackets and to keep the top of the radiator tubes or cells covered with water. Should the water level fall below this tank the cooling water in the jackets would be sure to boil, as it would have no means of circulation, the radiator would be of no value if circulation were to stop. The syphon is placed at the top of the system instead of the bottom for the same reason that the storage tank of a fire-protective sprinkler system is placed well up in the air instead of on the ground. A half-inch pipe, filled with water to the same height, would furnish equal pressure; but if a few quarts of water were drawn from it the pressure would diminish many pounds. So it is in the syphon tank, the loss of a small quantity has little effect on the cooling systems, provided the tank is not completely drained.

Water jackets, and all the water passages of the thermo-syphon system must be of ample size to facilitate the flow of the cooling water. Also sharp turns should be avoided. It will be noted that on the Model T and Fordson Tractor these details have been carefully worked out.

A radiator is a device which holds water or some other liquid, or fluid, and radiates into the air a portion of the heat of the liquid or fluid contained. The cooling water of a radiator absorbs some of the heat of the cylinder walls and, in the radiator, allows this heat to be absorbed by the air. A portion of the heat of the power impulse is absorbed by the cylinder walls. It is carried through them by conduction. At the outside of the cylinder walls it radiates into the surrounding water, which carries it away to the radiator, to the outside of the tubes and fins where it radiates into the air.

The two types of radiators used are the cellular and the tubular. The former consists of a series of cells sometimes arranged in sets or tiers. This type is known as the honeycomb radiator. The water flows from the top of the radiator down between those cells, where it is cooled by the current of air drawn through them. The cellular radiator is made in a large variety of design. In some the water flows straight down; in others it zigzags from side to side. This type employs no fins, but is complex even in its simplest form. The water passages are small, hence only a small amount of water is exposed to the air at one time. A natural or thermo-syphon circulation through such a radiator is seldom if ever efficient as the circulating rate is retarded because of the small openings and roundabout course the water follows. The manufacture of such a radiator is complex and expensive. While it can be made substantial it is difficult to repair, and weighs more than the tubular type. The small passages are easily clogged and very hard to clean. The cooling system rate of the cellular is usually too high, with a resultant loss of power due to a low temperature cooling water.

The tubular type of radiator is the simpler of the two. It is light in weight, strongly built, an efficient cooler, and is easily repaired. It permits an easy circulation of both air and water. Such is the radiator on the Ford Car and Fordson Tractor.

(To be continued)

Lincoln Water Pump

In the conventional design of water pump the pump shaft is supported on plain bronze bearings. When these bearings become worn there is excessive wear on the packing, and it is forced to act partially as a bearing for the shaft in addition to preventing the water from leaking. This makes it necessary to repack the pump frequently.

On the Lincoln water pump in addition to the plain bearings, a ball bearing is provided at each end of the pump shaft which keeps the shaft in perfect alignment and leaves the packing free to act as packing only and does not subject it to undue wear. This results in freedom from trouble and occasion for repacking the pump arises very seldom. To the best of our knowledge the Lincoln water pump is the only one incorporating a ball bearing shaft.

When the pump does develop a leak at the packing gland, care should be taken not to draw up the packing gland nut too tightly, as this will cause unnecessary friction and undue wear on the packing and pump shaft. Draw up the gland nuts just enough to stop the leak and no more.

If the packing gland nut can be drawn up to the limit of the thread without stopping an existing leak it will be necessary to replace the packing. In order to accomplish this operation satisfactorily the water pump should be removed from the engine. Considerable time will be saved in removing this assembly by observing the following procedure:

1, Drain cooling system—loosening radiator cap so that the water will flow readily.

2, Remove the right hand dust pan.

3, Remove the water connection from pump to radiator at the pump end. It is unnecessary to disturb the hose clamp.

4, Remove accessory shaft by removing the two opposite bolts at each end.

5, Detach water pipe which connects the pump and cylinder block.

6, Remove the cap screws which hold the pump to the crankcase and generator. The pump may now be removed from underneath.

7, Remove the generator clutch using service tool No. 15Z-12121.

8, Loosen clamp screw on the bottom of the pump housing remove dowel screw on the side and pull the rear bearing and cage assembly.

9, Pull yoke on front end of pump shaft, using tool No. 15Z-12121.

10, Remove front bearing and cage assembly.

11, Remove throw-off rings from each end of the pump shaft. The packing nuts and glands may now be backed off and the packing replaced.

Make certain that the packing is driven down well or else when the pump is re-assembled it will be found that the packing nuts can again be tightened to the limit of the thread for an initial setting.

After pump is re-assembled make sure that the pump shaft can be turned easily by hand. See that the clutch is well greased; thoroughly clean the finished surface on the crankcase to which the pump is attached and also the pad on the pump. Grease the gasket used at this point. Turn the pump shaft so that the yoke is in a vertical position. Also turn the generator shaft so that the openings in the clutch are vertical.

When assembling the pump to the engine, slide the pump on to the pilot on the generator making sure that driving flanges engage the slots in the cross and start the cap screws which bolt the pump to the generator. Start the screws which hold the pump to the crankcase and tighten down. Then tighten pump to generator screws. Assemble water pipe from cylinder to pump and water inlet pipe. Connect accessory shaft, replace dust pan and fill cooling system.

High Test Gasoline

In order to get full efficiency from present day fuel the carburetor intake manifold on the Lincoln engine is heated by the exhaust gases and also by the hot water returning to radiator.

Due to this feature the Lincoln engine will not operate satisfactorily on the high test gasoline sold in some localities. This high test fuel being so much more volatile than the fuel on which the engine is designed to run, the mixture is greatly expanded by the heat before reaching the cylinders and consequently a full charge is not drawn in, resulting in a decided loss of power.

Counterfeit Parts A Menace

The following photograph shows two broken offset spindles of counterfeit manufacture, which were recently the cause of a very serious accident.

A comparison of these parts with genuine Ford parts shows very plainly the reasons for their breakage.

First the counterfeit spindles were made from machine steel, whereas the genuine Ford

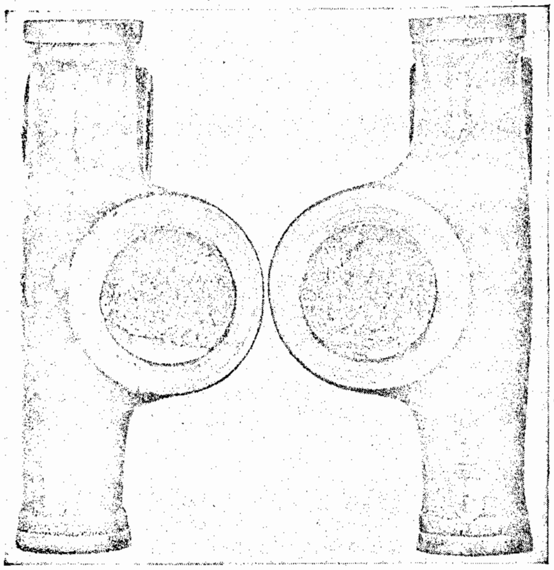

Fig. 5

parts are manufactured from special alloy steel, scientifically heat treated, to give the proper strength and hardness, to insure an exceptionally high safety factor.

The superiority of the genuine Ford spindle is further shown by comparing the following physical properties.

	Genuine Ford	Spurious
Elastic limit	130,000	50,000
Ultimate limit	150,000	80,000
Reduction of area	60%	50%

This shows that the counterfeit spindle is about ⅓ as strong as the genuine Ford spindle. It proves further that counterfeit parts are unsafe.

Owners who permit the installation of imitation parts are doing so at the risk of life and limb.

Point out the advantages of genuine Ford parts to your customers and call the attention of garages to the responsibility they assume when installing inferior material in their customer's cars.

This is a matter of vital importance and dealers should not overlook any opportunity to drive this fact home.

Number Markings on Model "T" Motors

Many dealers have raised the question as to the meaning of the several numbers which appear on different parts of the engine assembly.

In the assembly of the Ford engine there are several important operations, such as fitting of pistons, timing, hanging of transmission, testing, etc., that are numbered.

The men performing these operations are assigned numbers which are stamped upon the engine assembly at the completion of the operations. Thus the individual responsible for any particular line of work is obliged to leave his inspection mark upon the engine assembly.

This system of numbering operations assures us of workmanship of a high character, as it places the responsibility for satisfactory work directly on the workman.

The Starter Ring Gear

When the engine is stopped, the piston under compression tends to turn the crankshaft back until the compression is relieved, thus the crankshaft stops in one of two positions. When the Bendix gear engages, upon starting the engine again, the wear on the ring gear will therefore be at two points on the circumference. The repairman, when overhauling a motor, should remove the ring gear from the flywheel and replace it after turning it ¼ of the way around. This will bring the wear on a new section of the gear.

The Hand Brake Lever

The hand brake lever has a two-fold purpose, namely, to hold the clutch in neutral position and to act as an emergency brake.

Owing to the exceptionally efficient action of the Ford transmission brake, very few drivers have made any attempt to familiarize themselves with the use of the hand brake lever as a brake for emergency purposes. Consequently when the average driver is suddenly confronted with a situation which demands all the braking facilities of the car being instantly applied, he rarely ever thinks to make use of the emergency brake.

Dealers should impress upon owners the importance of so familiarizing themselves with the use of this lever as a brake for emergency purposes, that its use will become practically automatic when instantaneous action is necessary, explaining to them that a little effort on their part along this line will amply repay them should a real emergency arise.